

Newton's Third Law, Mass and Weight -  
Friction lab next class - Quiz Wed, Nov 8th

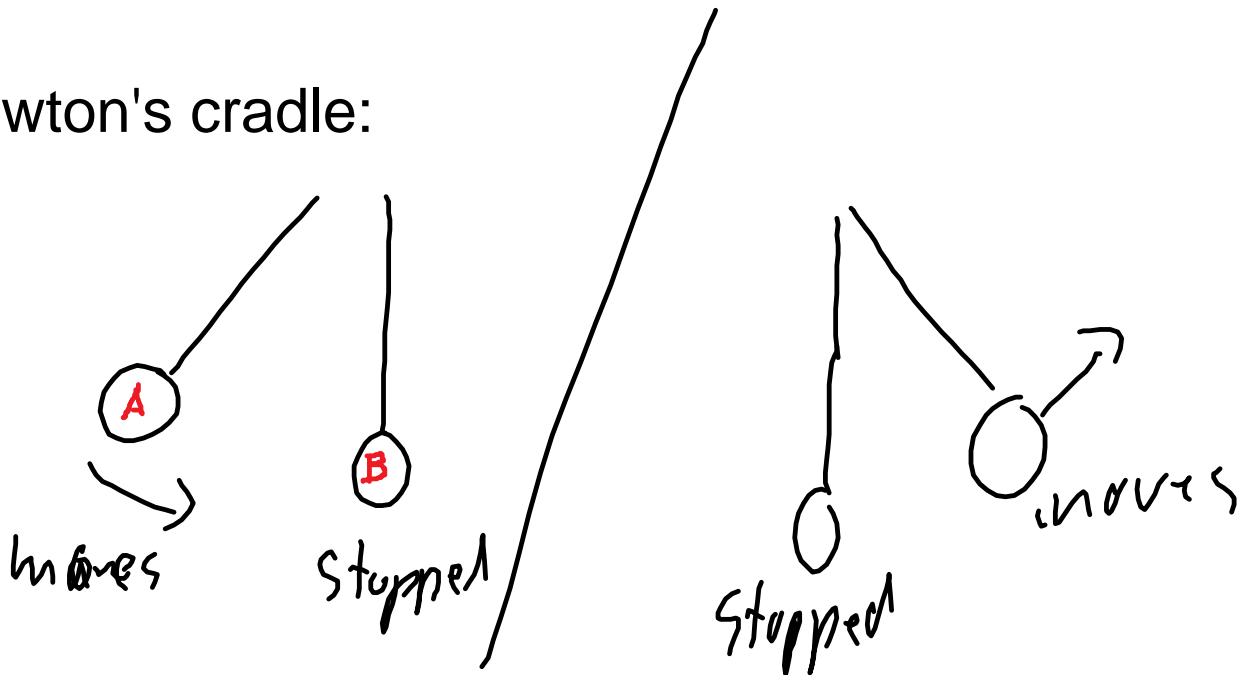
Newton's First Law - law of inertia  
- acceleration (changes in motion) require a net force.

Newton's Second Law - law of acceleration

$$F_{\text{net}} = ma \quad F_{\text{net}} = \sum F$$

Newton's Third Law - Action/reaction Law

Newton's cradle:



When A hits B, it pushes on it causing it to accelerate and move off. But A stops because it experienced the same force but in the opposite direction.

Newton's Third Law:

For every force object A acts on object B, object B responds with an equal but opposite force.

We will talk more about Newton's third law when we do momentum.

## Mass and Weight

I have a 1.0 kg mass, what does it weigh?

Common usage, you give your weight in pounds.

In physics we define weight as the force of gravity on an object. So we use units of Newtons when we talk about weight.

Falling objects accelerate at  $9.80\text{m/s}^2$ . By Newton's second law

$$F=ma$$

so gravitational force  $F_g$ , also known as weight  $W$  in the book,  $F_g = mg$

where  $g=9.80\text{m/s}^2$  or  $9.80\text{ N/kg}$  (same thing because  $\text{N}=\text{kgm/s}^2$ )

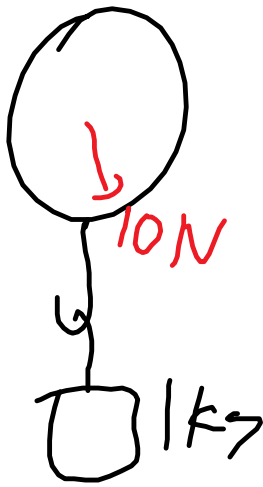
if weight is  $= mg$ , what is mass?

mass: units of kilogram, kg

what is mass? Amount of stuff is a good start

for the definition.

A spring scale gives the weight in Newtons.



$$?m = ? \quad m = \frac{F_g}{g} = \frac{5N}{9.8 \frac{N}{kg}}$$

$$m = 0.5 kg$$

If we took these two masses and the spring scale to the moon,  $g=1.6N/kg$ . what would be their

a) masses?   b) weights?

a) 1kg on Earth = 1kg on Moon  
0.5kg on Earth = 0.5kg on Moon

b) 9.8N on Earth = 1.6N on Moon  
4.9N on Earth = 0.80N on Moon

$$F_g = mg = 1.0 \times 9.8 = 9.8$$

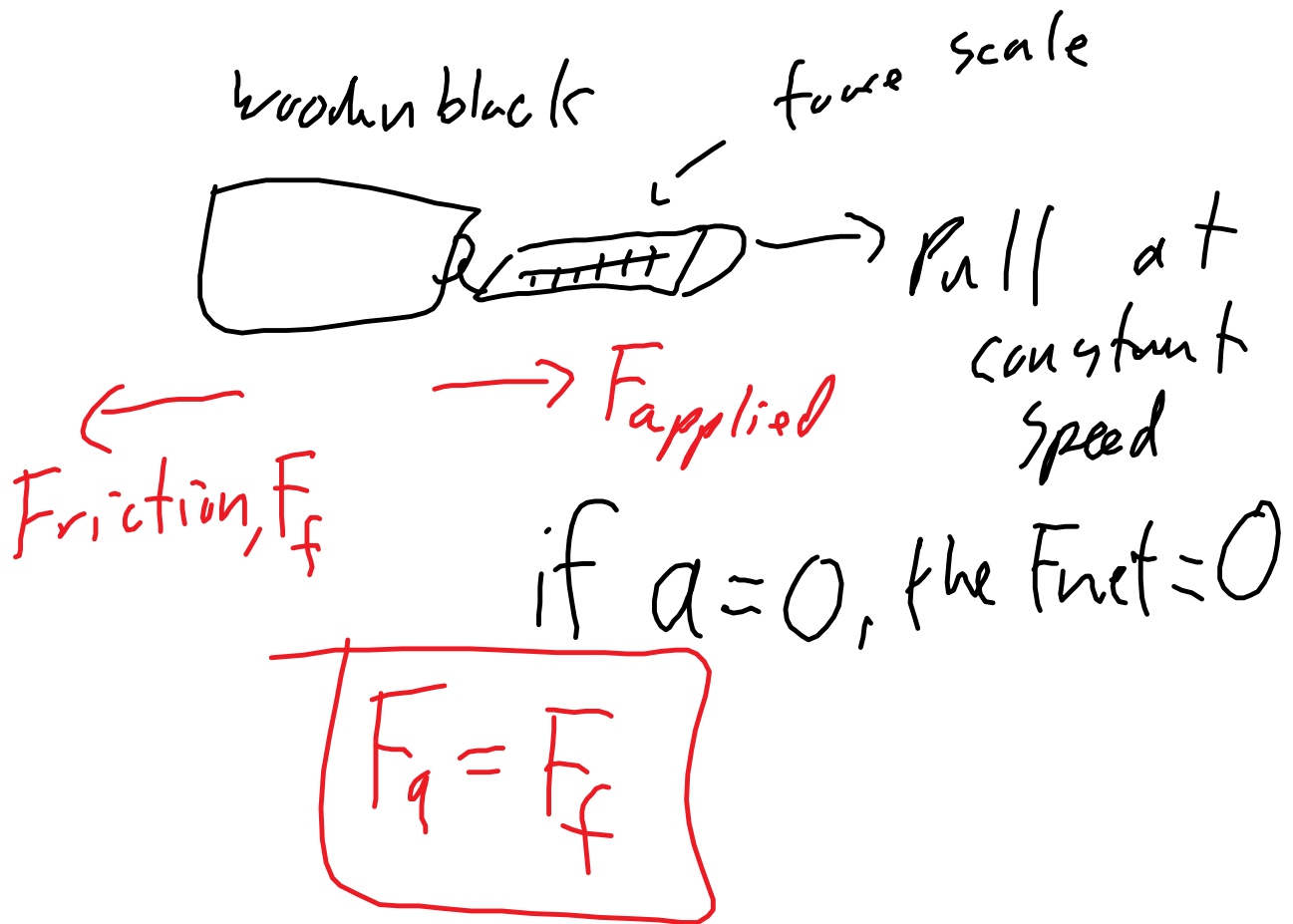
$$1.0 \times 1.6 = 1.6$$

$$0.5 \times 9.8 = 4.9$$

$$0.5 \times 1.6 = 0.8$$



Friction Lab next class:



Problem: What factors affect the force of friction on the wooden block pulled on the table?

no graphs, so you should be able to finish in class.

Read the lab p 31

<http://physics-pages.wikispaces.com/file/view/LAB%2BMANUAL%2BPhysics%2B11.pdf/604456999/LAB%2BMANUAL%2BPhysics%2B11.pdf>

greek letter, mu

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greek letter, mu  
coefficient of friction,  $\mu = F_f/F_N$   
where  $F_N$  is the normal force, the force the  
table pushes up on the block  
for this lab,  $F_N = F_g$  on the block  
and  $F_f =$  the applied force,  $F_a$

$$\mu = F_f/F_N = F_a/F_g$$